INTERIM RESPONSE ACTION PLAN

317 AREA SOIL AND GROUNDWATER REMEDIATION

Prepared for:

Approved RCRA Closure Plan at

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I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of California.

6-7-89

Norman C. Wenck — Registration Number 41317

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I. INTRODUCTION

A. Background

The Bermite Division of Whittaker Corporation discontinued operations effective April 3, 1987. In April 1987, a Revised RCRA Closure Plan was submitted to the California Department of Health Services (DHS) and to the U.S. Environmental Protection Agency (EPA) Region IX for approval. The DHS and the EPA approved the Closure Plan, with modifications, via their letter of transmittal dated December 28, 1987. The Closure Plan specifies the activities required for closure of the various RCRA units which were present at the facility. The RCRA unit, labeled 317 Area, is a former lined surface impoundment for storage of spent solvents. This unit was closed in 1983. The Bermite facility Site Plan is included as Figure 1.

Pursuant to the Closure Plan, a Work Plan For Soils Investigation and Removal at the 317 Area was implemented for the purpose of characterizing the vertical and horizontal extent of volatile organic compounds (VOCs) in the soils at this RCRA unit. This Work Plan is contained in the Closure Plan and is incorporated herein by reference.

The soils from the 317 Area were analyzed in the field as they were excavated and soil samples were collected and analyzed at a DHS certified laboratory. A report, <u>Progress Report of Soil Characterization at the 317 Area</u>, date March 1988, was submitted to the DHS and EPA after completion of the Trench A. The results of the excavation of Trench B and C were submitted to the DHS and EPA in a report titled, <u>Soil Characterization at the 317 Area Progress Report No.2</u>, dated June 1988. The results of the excavation of soils from Trench D are contained in a report titled, Subsurface Vapor Probe Plan - 317 Area, dated February 1989. This report details the procedures for the determination of the vertical extent of VOC in the soils below the 50-foot depth.

As a result of the installation of subsurface vapors probes, a report entitled Vapor Probe Construction and Measurements at the 317 Area, dated April 1989, was submitted to DHS and EPA for review and approval. Measurements of the organic vapors in these vapor probes has determined that the VOC concentrations increase to a depth of approximately 60 feet below the present ground surface and the concentrations decrease to low levels at the total depth of the vapor probes, 120 feet below the present ground surface. Four additional vapor probes have been installed at the 317 Area. The location of all vapor probes is shown on Figure 3. Vapor probe screen depths and a tabulation of vapor probe readings to date is included in Table 1.

As a requirement of the Closure Plan, two of the RCRA units (317 Area and 342 Area) require a groundwater monitoring system capable of detecting and assessing the impact of the two RCRA units on the uppermost aquifer at the Bermite Facility. A preliminary Groundwater Monitoring Plan for the 317/342 Area, originally submitted in the Revised RCRA Closure Plan in April 1987, was revised and submitted to the DHS and EPA for review and approval on October 8, 1987. This plan, titled "Revised Groundwater Monitoring Plan for the 317/342 Area," October 8, 1987, detailed the location and construction of three RCRA wells to be used for characterization of the uppermost aquifer at the Bermite facility. A number of discussions and meetings were held with the DHS concerning specific aspects of the construction of the RCRA wells. Subsequently, two of the three wells were completed. The location of the third well was determined by the DHS and this well was completed in the same manner as the first two RCRA wells. A documentation report, "Construction and Development of

Wells for Groundwater Monitoring of the 342 and 317 Areas," February 1988, describing the installation of the wells and information gained from them concerning preliminary groundwater quality and aquifer characteristics, was submitted to DHS and EPA for review and approval in February 1988.

After review of the results of the installation of the three wells, a fourth RCRA well was proposed to the DHS and EPA in a report titled, "RCRA Groundwater Monitoring System-Proposed Final Configuration," May 1988. This fourth well was constructed similarly to the first three wells. A documentation report titled, "Construction and Development of RCRA Groundwater Monitoring Well at the 342 and 317 Areas," August 1988, describing the construction of the fourth well, groundwater gradient information compiled from all four wells, and further preliminary groundwater quality data, was submitted to DHS and EPA for review and approval in August 1988.

While the groundwater monitoring system was being proposed, installed and documented in a number of reports, presented to the DHS and EPA, a sampling and analysis plan for collecting and analyzing representative groundwater samples from the RCRA wells was concurrently prepared and sent to DHS and EPA in December 1987. This plan, titled "Proposed Interim Status Groundwater Monitoring Sampling and Analysis Program" December 1987, was reviewed and modified by DHS and EPA, in March 1988. The "Groundwater Sampling and Analysis Plan," was revised and submitted to DHS and EPA in August 1988.

B. Recent Activities

This first formal sampling and analysis episode of the four RCRA wells was proposed to the DHS and EPA for the first week of October 1988 and occurred on October 3,

1988. All results were tabulated, including those analyses of groundwater samples taken from the four RCRA wells prior to October 1988 and presented in "RCRA Groundwater Sampling, Quarterly Sampling Report No. 1". The results of the first sampling event verified earlier sampling and analysis results and showed that the groundwater was free of contamination.

The second quarterly sampling event occurred in January 1989. The results of the January 1989 sampling are contained in the report entitled "RCRA Groundwater Sampling Quarterly Sampling Report No.2", dated March 31, 1989, and showed that the groundwater was free of contamination.

The third quarterly sampling event occurred in April, 1989. Three volatile organic compounds were detected in monitoring well MW-4 and were subsequently confirmed, by analytical results from a different laboratory, from samples collected on May 17, 1989. Notification of these findings were made to the DHS and EPA in compliance with 40 CFR 265.93 (d((1). In accordance with these regulations a "Specific Plan for a Groundwater Quality Assessment Program" has been submitted to DHS and EPA for review and approval.

C. Purpose

The purpose of this Interim Response Action Plan is to present remedial actions to contain, remove and treat VOC in the soils and groundwater in the immediate vicinity of the 317 Area. These actions are described herein and will be implemented expeditiously in order to contain the VOC and prevent migration of the VOC.

Implementation of the Specific Plan for Groundwater Quality Assessment Program and on-going measurements of the existing vapor probes will provide documentation for the assessment of the effectiveness of these remediation actions.

II. SUBSURFACE SOIL CONTAMINATION

A. Definition of the Problem

As indicated above, soils containing VOC have been excavated at the 317 Area to a depth of approximately 50 feet. The soils below this depth contain VOC. As shown on Table 1, the highest concentration of the VOC is located in the vicinity of probe nests P1 and P2 at approximately the 60 foot depth (see Figure 3). The VOC concentrations decrease in the direction of probes P4, P5, P6 and P7.

The reports referred to in Part I, above, indicate the presence of 19 different volatile organic compounds. Of the nineteen, the great preponderance is composed of two, trichloroethylene (TCE) and tetrachloroethylene (PCE). Many of the remaining compounds are the degraded compounds of these first two and are present in only very low concentrations.

These compounds will volatilize rapidly and completely under normal atmospheric conditions. Subsurface borings advanced into the 317 Area soils in July 1987 showed variable but low moisture contents of the soils. It is assumed therefore, that the interstitial pore spaces of the subsurface soils in the vicinity of probe nests P1 and P2 contain a high percentage of VOC vapors.

B. Alternative Remedial Technologies

A number of technologies and combination of these are available for remediation of soils containing VOC four of these technologies, chosen for the likeliness of their suitability to this site, are briefly reviewed below. Based on the qualitative criteria of:

- Proven Technology
- Applicability to 317 Area
- Permitability

the most feasible alternative has been chosen.

1. Excavation and Disposal

The first technology considered was the continuation of the excavation of the contaminated soils remaining at the 317 Area which would require the excavation of many hundreds of thousands of cubic yards of clean soil in order to remove contaminated soil. In the process soils would be mixed creating, perhaps, an even larger remediation problem.. In addition, the two groundwater monitoring wells, MW-1 and MW-4 (see Figure 2), would be destroyed and would require replacement.

The excavated soils that contain significant levels of VOC would require containment upon excavation according to current regulations of the South Coast Air Quality Management District (SCAQMD). It is possible that excavation of the VOC containing soils would not be permitable by the SCAQMD because of the difficulty of controlling the volatilization of the VOC to the atmosphere.

If the soils could be excavated, the soils containing VOC would require treatment or disposal. Treatment of the soils could be accomplished by one of the technologies discussed below. Disposal of the soils would require transport to a Class I landfill using valuable landfill space to store wastes treatable with less environmentally costly alternatives.

2. In-Situ Biodegradation

The second alternative considered was bioremediation or biodegradation.

Biodegradation of the VOC in the subsurface soils is a natural process whereby the organic compounds are degraded into innocuous products. This is accomplished through a series of biochemical reactions, where the original volatile organic compounds are transformed in the soil to organic and inorganic end products including carbon dioxide, water, nitrogen, phosphorus and sulfur.

In order for these processes to occur, sufficient microbial populations must exist in the soils and growth of the population has to be promoted by the addition of nutrients and oxygen to the soils.

There are inherent problems with ensuring that all the soils at the 317 Area would receive sufficient nutrients and oxygen. Injection of the materials into the soils via injection wells could be accomplished, but due to the complex geological formation that exists down to the 60-foot depth (alternating layers of clay/clayey sand/gravel), the proper placement of the nutrients could not be ensured.

The possible adverse effects on groundwater quality, due to the placement of nutrients into the soils, may prohibit the permitting of this remedial action.

3. Soil Solidification

The third alternative considered was encapsulation by soil solidification.

Solidification of the soils containing the VOC is a process where a chemical slurry is injected into the subsurface soils, and this slurry combines with the soil matrix, which then hardens and encases the VOC in the hardened soil/slurry matrix. This process has been shown to have some efficacy when applied to shallow (<30 feet) soils of fairly homogenous nature. This process is not well suited for the 317 Area, due to the depth to which the VOC exists and the nature of the soils at the site.

4. In-Situ Vapor Extraction

The fourth alternative considered was in-situ vapor extraction.

The air and vapors that exist in the interstitial space between the soil particles in the subsurface soils can be removed from the soils by the application of a vacuum to extraction vents placed in the soils. The VOC in liquid form in the pore space will volatilize as a non-equilibrium between the liquid and surrounding air space occurs. Fresh air existing in clean soils surrounding the contaminated soils will take the place of the VOC vapor laden air. The depth to which air and vapors can be extracted is only limited by the depth to which the extraction vents can be placed.

This type of system is particularly well-suited to this area due to loose alluvial soil on much of the site and has been successfully applied to the remediation of sites similar to the 317 Area.

The air and vapors that are brought to the surface through the vents and header pipes connecting the wells will be controlled to prevent uncontrolled emissions of the VOC to the atmosphere. There are a number of such control processes, including capture and bio-degradation, thermal or catalytic oxidation, condensation, and carbon adsorption.

5. Conclusion

A vapor extraction system is the most feasible alternative for soil remediation at the 317 Area because 1) it is a proven technology for remediating sites similar to the 317 Area, 2) the system would have little or no effect on the groundwater or surrounding soils and monitoring well installations, and 3) the system is recognized by local regulatory agencies as an effective remediation methodology.

III. PROPOSED SUBSURFACE SOIL REMEDIATION

A. In-Situ Vapor Extraction

1. General

For the reasons set forth above, in-situ vapor extraction (ISV) and treatment is the method proposed by Whittaker for effective site remediation. As indicated above, we believe it to be the most feasible alternative to achieve clean closure of the 317 Area.

A conceptual design of the proposed ISV system is presented below. The final configuration of the system will be site-dependent and will be completed in a phased approach. Based on the performance results of the two initial vapor extraction vents, additional vents may be installed.

The system of vapor control will also be approached in a phased manner. Initially, activated carbon will be utilized to remove the VOC from the airstream. Alternative vapor control technologies will be reviewed and the best available control technology will be chosen for the final ISV configuration subject to applicable regulatory approval.

As a requirement of the Closure Plan referenced above, pilot testing of the remediation method chosen will be performed. The phased approach to the full scale or final configuration of the ISV system will provide the necessary operational and site specific data required for the full scale design. The initial two vapor extraction vents and operation of them will be considered the pilot test of the full scale ISV system.

2. Conceptual Design

A full scale ISV system at the 317 Area will require a series of vacuum extraction vents screened to the depth of the VOC containing soils. The vents will be four-inch diameter polyvinyl chloride (PVC) which will require a screened section from a depth of approximately 10 feet below the surface to the bottom of the extraction vent. In order to effect air flow through the soils to be remediated an array of extraction vents will be required. Based on the experience of other ISV systems, the spacing of these extraction vents is site dependent but could be expected to be from 20 - 80 feet.

The extraction vents will be connected at the surface to a common header system which will lead to a vacuum blower. The blower will be sized and the header system designed to provide equal vacuum and extraction flow rates at each extraction vent.

Initially two vapor extraction vents will be installed at the locations shown on the enclosed Figure 3. These two vapor extraction vents are located in the area of the greatest known soil contamination. As experience is gained from the operation of these two initial vapor extraction vents, additional vapor extraction vents and header system (and vacuum blowers if necessary) will be installed. The initial vapor control system for the ISV system will be designed on the known concentration of emissions from the vapor probes referenced above. Initially, activated carbon filters will be used to provide control of the organic vapors. Operation and monitoring of the systems will be controlled in order to assure that the VOC is removed and that emissions limits are not exceeded. Permits for the operation of the ISV system will be obtained from the necessary regulatory bodies governing this facility.

B. Vapor Extraction Vents

1. Location

As indicated above, the initial two vapor extraction vents are to located as shown on the enclosed Figure 3. These wells are strategically located in the area of the highest known concentrations of VOC in the subsurface soils. The vents will be spaced approximately 50 feet apart from each other.

2. Construction

An extraction vent construction detail is shown on the enclosed Figure 4. The extraction vents will be constructed of four-inch diameter Schedule 40 polyvinyl chloride (PVC). The screen section of each vent will be from the ten foot depth to the total depth of the vents, approximately 120 feet. Each screen shall be 0.05 inches slot size. The screens will be gravel packed in the angular space between the screen and boring wall with a No. 3 Lonestar gravel pack. The bottom of each screen will be capped with a PVC plug. From the ten foot depth to the ground surface the extraction vents will be constructed of solid four-inch diameter Schedule 40 PVC. The annular space surrounding the solid PVC will be sealed with a cement bentonite grout.

C. Vapor Extraction System

1. Vacuum Blower

The vacuum source for these vapor extraction vents will be a positive displacement vacuum blower sized to provide at least 100 actual cubic feet per minute (acfm) of air flow per extraction vent. It is anticipated that up to 40 inches water vacuum pressure will be required at each vent to provide the extraction flowrate.

2. Header System

The extraction vents will be connected at the surface with a common header pipe. The header pipe will be four inch diameter Schedule 40 PVC and will connect the two extraction vents to the common vacuum blower. Flow control valves will be located at the head of each extraction well in order to provide control of the vapor extraction rate at each well. Start-up of the vapor extraction system will include flow rate measurements in order to assure the desired flow rate at each well. Measurement of the induced vacuum pressure of the subsurface soils will be measured with an inclined water manometer at the head of the vapor extraction vents and in each of the existing vapor probes which are screened at discreet intervals in the subsurface soils. A schematic of the proposed vapor extraction system is included as Figure 5.

The vacuum pressure versus extraction flow rate relationships observed during operation of these initial vapor extraction vents will indicate the need for additional vapor extraction vents, the spacing of them, and any additional header pipes.

3. System Operation

Vacuum pressures during operation will be measured both at the head of the extraction vents and in the existing vapor probes. It is expected that the vacuum pressures developed in the subsurface soils will decrease radially from the extraction vents and can be measured as a pressured head. The existing vapor probes provide ideal observation wells because of the number of probes, the different distances that they exist from the proposed extraction vents, and because they are screened at discreet intervals within the subsurface soils. The vacuum pressures are expected to vary from a fraction of an inch of water up to the limits of the vacuum source. For the low vacuum pressures an inclined manometer will be used for the measurements. For vacuum pressures greater than approximately 20 inches of water column, a magnehelic gauge will be used.

4. Full Scale System Design

The vacuum pressure measurements collected at the existing vapor probes and at the proposed vapor extraction vents will provide the data required to install additional vapor extraction vents (if necessary). It is anticipated that during operation of the initial two vapor extraction vents that the extraction flowrate of the vents will be varied. These different flowrates will be compared against the vacuum pressures observed to provide a graph of the radius of influence of the vapor extraction vents as a function of extraction flowrate.

The measured VOC emissions during the operation of the ISV system will provide information on the concentrations of VOC necessary for the design of a long term vapor control system.

D. Extracted Vapor Control

1. Initial

As indicated above, activated carbon adsorption will initially be used to provide control and removal of the VOC from the extracted air stream. This is shown schematically on Figure 5. The emissions will be monitored by sample collection and analysis as discussed below and by daily organic vapor measurements with an Organic Vapor Analyzer (OVA).

The OVA will be calibrated daily to a hexane standard gas and readings will be collected at the head of both extraction vents, the inlet to the activated carbon filters and at the outlet of the activated carbon filters.

Upon breakthrough of the primary activated carbon filters, new primary filters will be placed on line by changing the flexible piping and quick disconnect from the spent filter to a new filter. This process will allow continuous operation of the vapor extraction system.

The spent carbon filters will be removed from the site and regenerated by the activated carbon filter supplier. Manifests of the transportation and regeneration of the carbon filter will be provided.

2. Long Term

There are a number of alternative vapor control technologies available for control of volatile organic compounds including activated carbon adsorption, thermal or catalytic oxidation and vapor condensation. As indicated above, activated carbon will initially be used for vapor control. It is readily available and permitted systems exist in the SCAQMD. Other control technologies will be researched. If a control technology different from carbon adsorption is found to be more advantageous, the application of the technology will be proposed for approval to the DHS and EPA.

E. Extracted Vapor Analysis

1. Sample Collection

Air samples will be collected from the vapor extraction system at the head of each vapor extraction vent in order to provide information regarding the extraction rate of VOC. In addition samples will be collected both at the inlet and outlet of the vapor control system in order to verify the removal efficiency.

Samples will be collected with a syringe sampling pump fitted with a two way valve. A sample of extracted air and vapor will be removed from the air stream within the header system and pumped to Tedlar[R] sample bags. Air samples will be collected during the startup of the vapor extraction system on a daily basis for four consecutive days and monthly thereafter for three months and quarterly thereafter. Daily OVA readings of the operation of the system will be collected and calibrated to the laboratory analytical results to provide a continuous record of operation.

2. Sample Analysis

Each air sample will be analyzed by EPA Method 8010. The sample analysis protocol for this method is contained in EPA SW846.

3. Reporting

A quarterly report of all soil remediation activities will be submitted to DHS and EPA for review and approval. The report will contain information on: extraction flowrates, VOC mass removal rates, and activated carbon usage. The report will include as exhibits disposal manifests, laboratory and field analytical results, and details concerning any proposed system design or operation modification.

IV. PROPOSED GROUNDWATER REMEDIATION

A. General

It is proposed to remediate the contaminated groundwater by pumping the groundwater, removing the VOC by filtration through granular activated carbon, and, following analysis to ensure removal of all contaminants, discharging the clean water to the surface at the Bermite facility.

Because of the relatively low concentrations of VOC that have been detected to date and lower concentrations that will be experienced during pumping granular activated carbon filters are expected to remove the VOC from the groundwater to non-detectable levels.

The quality of the groundwater at the 317 Area, other than the recent detection of VOC, has been shown in the above referenced reports to be of very high quality. After activated carbon treatment, the pumped groundwater will be of equal quality.

B. Gradient Control Well

The pumping of groundwater from the immediate vicinity of the 317 Area is a relatively simple matter. A gradient control well (GCW) for this purpose has been installed at the 317 Area. The location of this well was installed after confirmation of the VOC in well MW-4 was received and is shown on the attached Figure 2.

Well GCW is six (6) inches in diameter and is screened from 863-813 feet (NGVD). The well screen and casing are steel. The screen is gravel packed and the casing annular space is sealed with a cement bentonite grout.

A pump has been installed that has a rated capacity in excess of 70 gallons per minute (gpm).

Based on the results of an aquifer test to be performed, the pumping rate required to create an appropriate radius of influence of the well will be chosen. This radius of influence will be based on the analysis results of the monitoring wells, including MW5 and MW6 which are proposed in Specific Plan, Groundwater Quality Assessment Program, June 1989 submitted to the DHS and EPA for review and approval.

C. Groundwater Treatment and Disposal

The groundwater will be treated by a granular activated carbon filter. The filter unit to be used contains approximately 1200 pounds of granular activated carbon and is rated for a flowrate of 70 gpm. The filter unit is 54 inches in diameter, 60 inches high, is equipped with a 75 micron prefilter and can be backwashed to prevent channeling.

At an influent concentration of 10 mg/kg of VOC, and at a flowrate of 70 gpm, the filter is estimated to be effective for approximately one (1) year. The effluent will not contain detectable concentrations of VOC.

The treated and clean water will be discharged to the ground surface at the Bermite facility, where it will infiltrate and evaporate.

D. Groundwater Analysis

Samples of the groundwater from well GCW will be collected and analyzed for the VOC. Samples will be collected both at the inlet and outlet of the granular activated carbon filter.

The groundwater samples will be analyzed by EPA Method 601 which will detect the VOC's of interest. Samples will be collected on a weekly basis for one (1) month, monthly for 3 months, and quarterly thereafter. The initial and quarterly sampling will include field blanks for quality control. The sampling procedures and protocol of the Groundwater and Sampling Analysis Plan, August 1988, used for the quarterly sampling of the monitoring wells at the 317 Area, will be followed as appropriate.

E. Reporting

A quarterly report of all groundwater remediation efforts will be submitted to the DHS and EPA for review and approval. The report will include groundwater pumping rates, VOC mass removal rates, laboratory analysis of samples collected and recommendations for system modifications.

TABLES

TABLE 1

HISTORY OF VAPOR PROBE MEASUREMENTS AT THE 317 AREA

	PROBE NEST P1						PROBE NEST P2					
	SCREEN ELEVATION						SCREEN ELEVATION					
DATE	1443	1423	1403	1383	1363	1343	1442	1422	1402	1382	1362	1342
22-Mar-89	200	400	5000	200	150	0	2700	3900	11900	3400		55
29-Mar-89	400	700	7500	1100	800	80	1500	6500	8000	5500		230
06-Apr-89	500	1000	7000	800	800	20	1500	4000	4000	2500	100	200
13-Apr-89	1200	2000	8000	1200	900	600	4800	7500	9000	5000	700	250
20-Apr-89	1200	2600	11000	1200	1000	70	3200	8000	8000	4000	50	190
03-May-89												
05-May-89												
08-May-89												
22-May-89												

NOTE:
1) SCREEN ELLEVTIONS REFERENCED TO NGVD AND ROUNDED OFF TO THE NEAREST FOOT
2) PROBE RESULTS ARE IN PPM(V) DETERMINED BY ORGANIC VAPOR ANALYZER
(OVA) CALIBRATED TO METHANE

TABLE 1

HISTORY OF VAPOR PROBE MEASUREMENTS AT THE 317 AREA

	PROBE NEST P3						PROBE NEST P4		
	SCREEN ELEVATION						SCREEN ELEVATION		
DATE	1442	1422	1402	1382	1362	1342	1400	1360	1340
22-Mar-89	350	300	200	600	350	50			
29-Mar-89	400	900	850	700	230	210			
06-Apr-89	500	1000	900	200	250	220			
13-Apr-89	1000	2000	1500	850	240	170			
20-Apr-89	1000	2500	2000	1000	320	200			
03-May-89							700		15
05-May-89									
08-May-89									
22-May-89									

NOTE:
1) SCREEN ELEVATIONS REFERENCED TO NGVD AND ROUNDED OFF TO THE NEAREST FOOT
2) PROBE RESULTS ARE IN PPM(V) DETERMINED BY ORGANIC VAPOR ANALYZER
(OVA) CALIBRATED TO METHANE

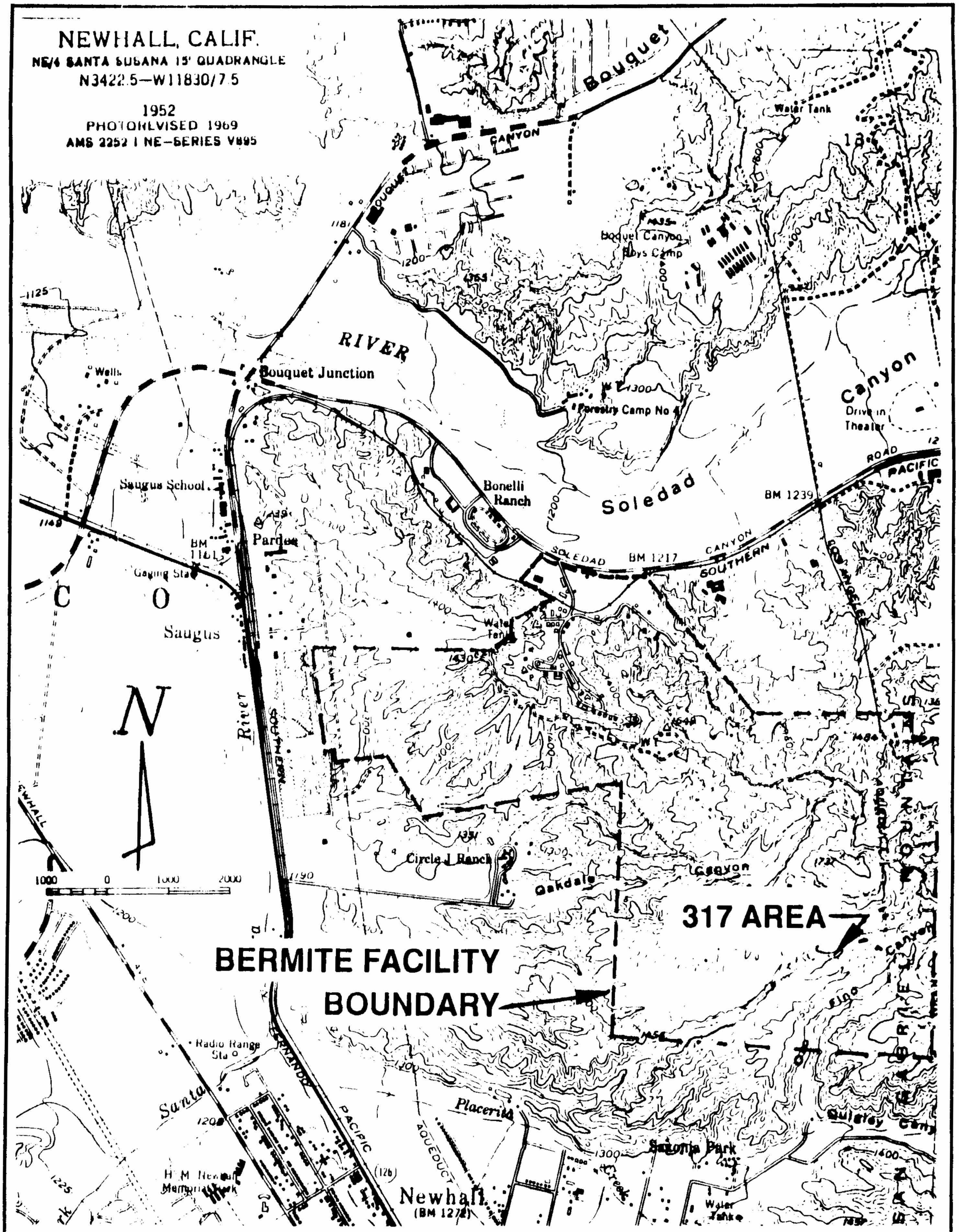
TABLE 1

HISTORY OF VAPOR PROBE MEASUREMENTS AT THE 317 AREA

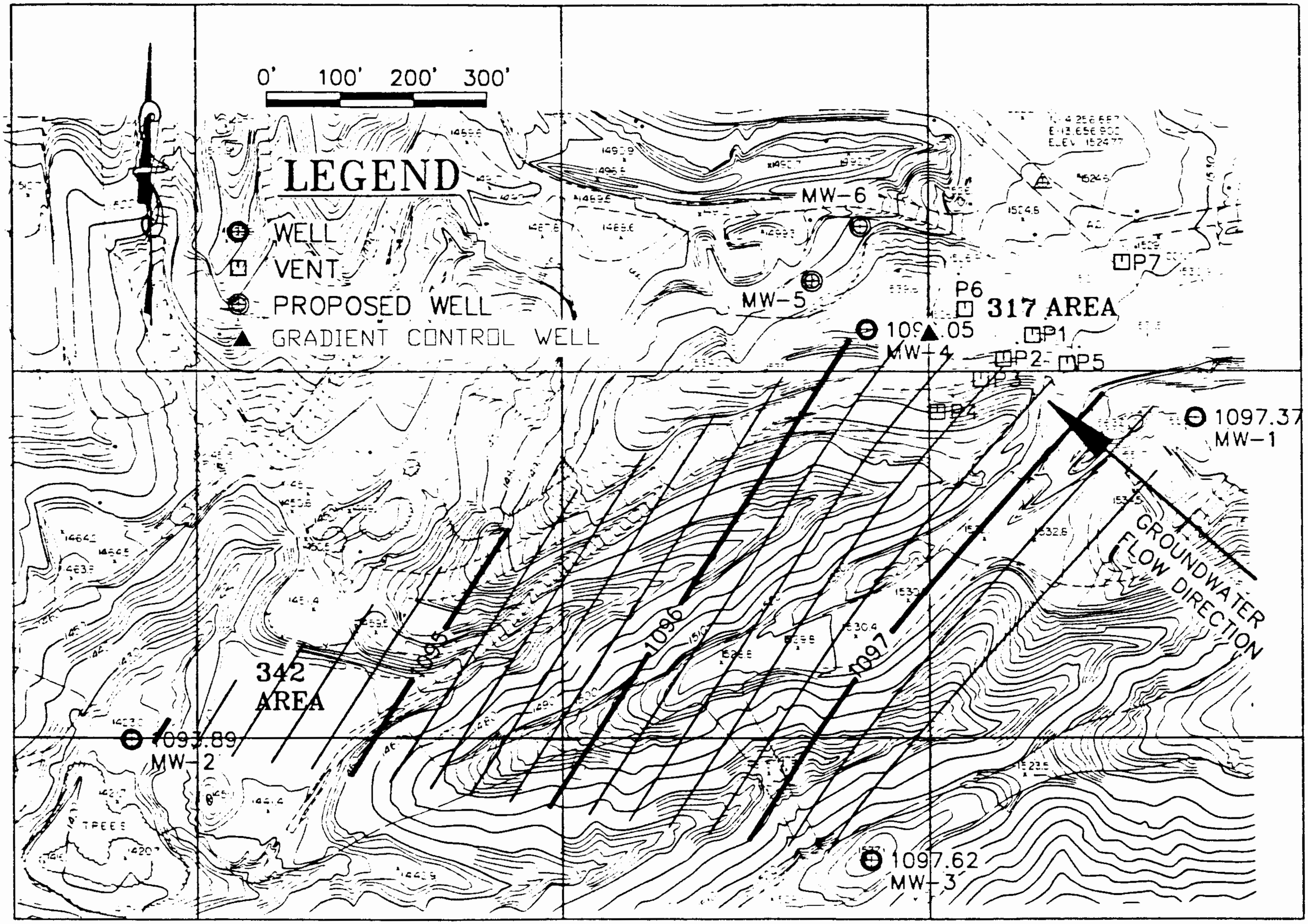
	PROBE NEST P5			PROBE NEST P6		PROBE NEST P7	
	SCREEN ELEVATION			SCREEN ELEVATION		SCREEN ELEVATION	
DATE	1402	1362	1342	1478	1445	1486	1459
22-Mar-89							
29-Mar-89							
06-Apr-89							
13-Apr-89							
20-Apr-89							
03-May-89	50	110					
05-May-89				25	160		
08-May-89						50	110
22-May-89				160	120	110	300

NOTE:
1) SCREEN ELEVATIONS REFERENCED TO NGVD AND ROUNDED OFF TO THE NEAREST FOOT
2) PROBE RESULTS ARE IN PPM(V) DETERMINED BY ORGANIC VAPOR ANALYZER
   (OVA) CALIBRATED TO METHANE

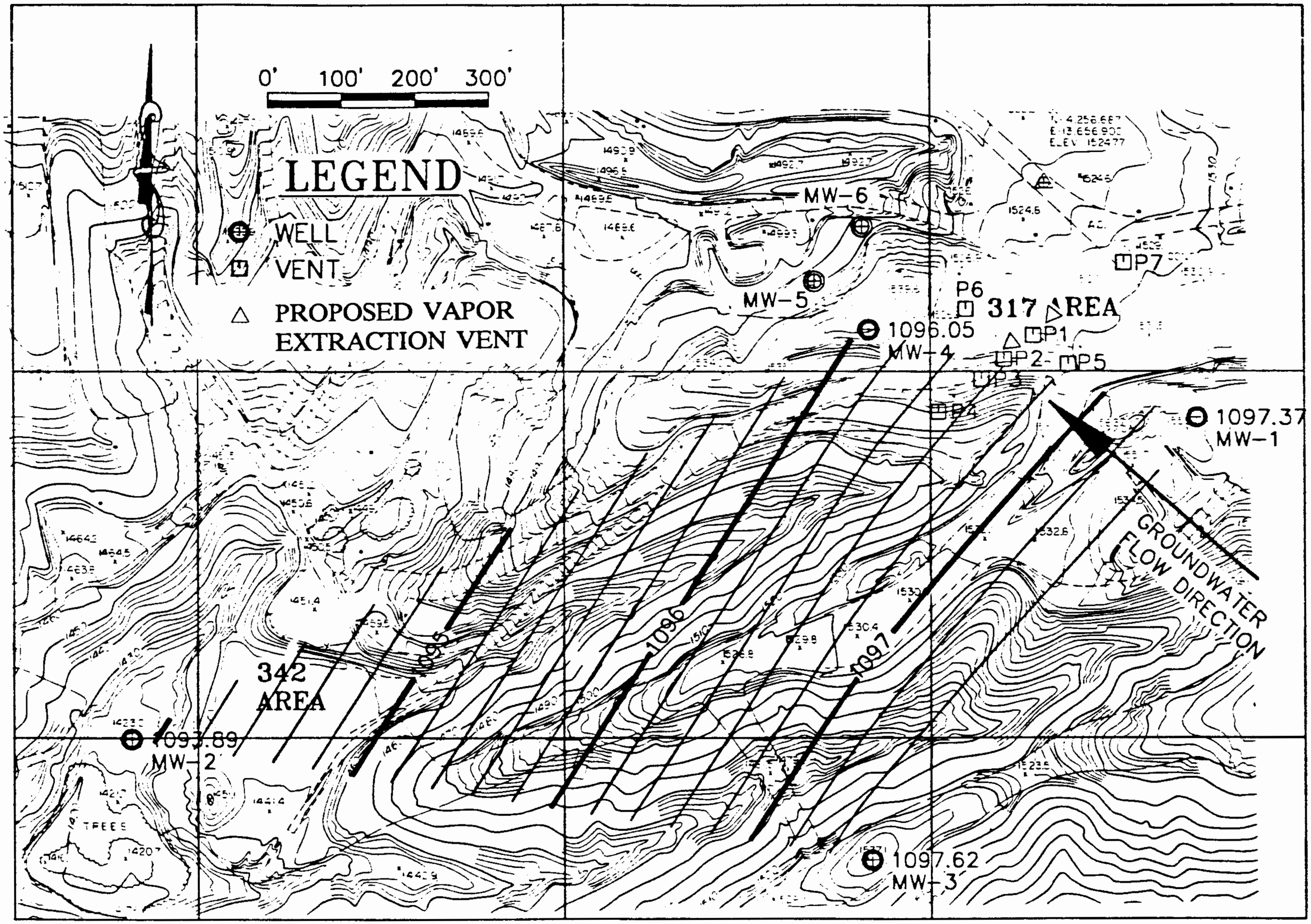
FIGURES



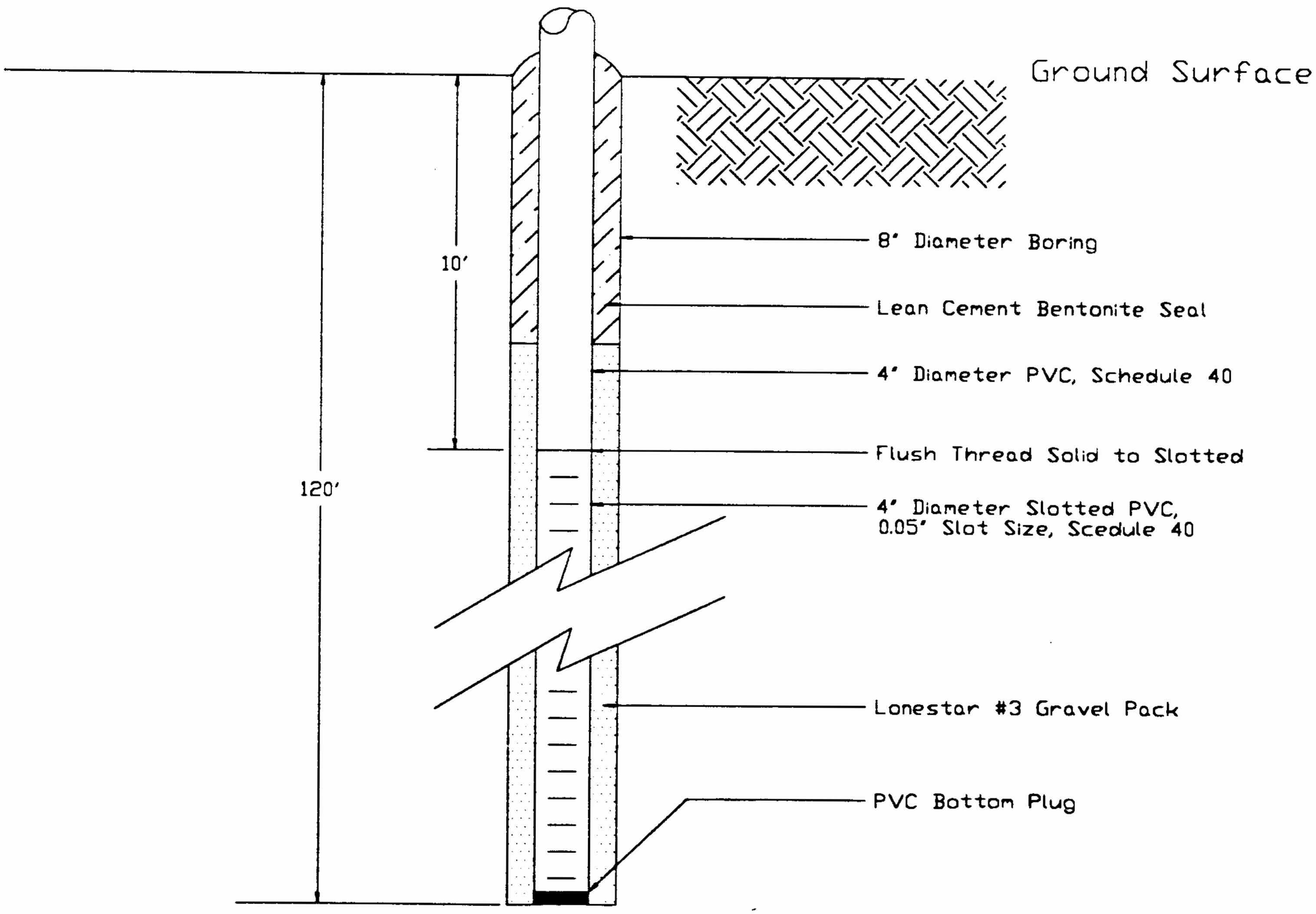
BERMITE DIVISION - WHITTAKER CORPORATION	Consulting Engineers	JUN 1989
Site Plan	Wenck Associates, Inc. Twelve Oaks Center 15500 Wayzata Blvd. Wayzata, MN 55391	Fig. 1



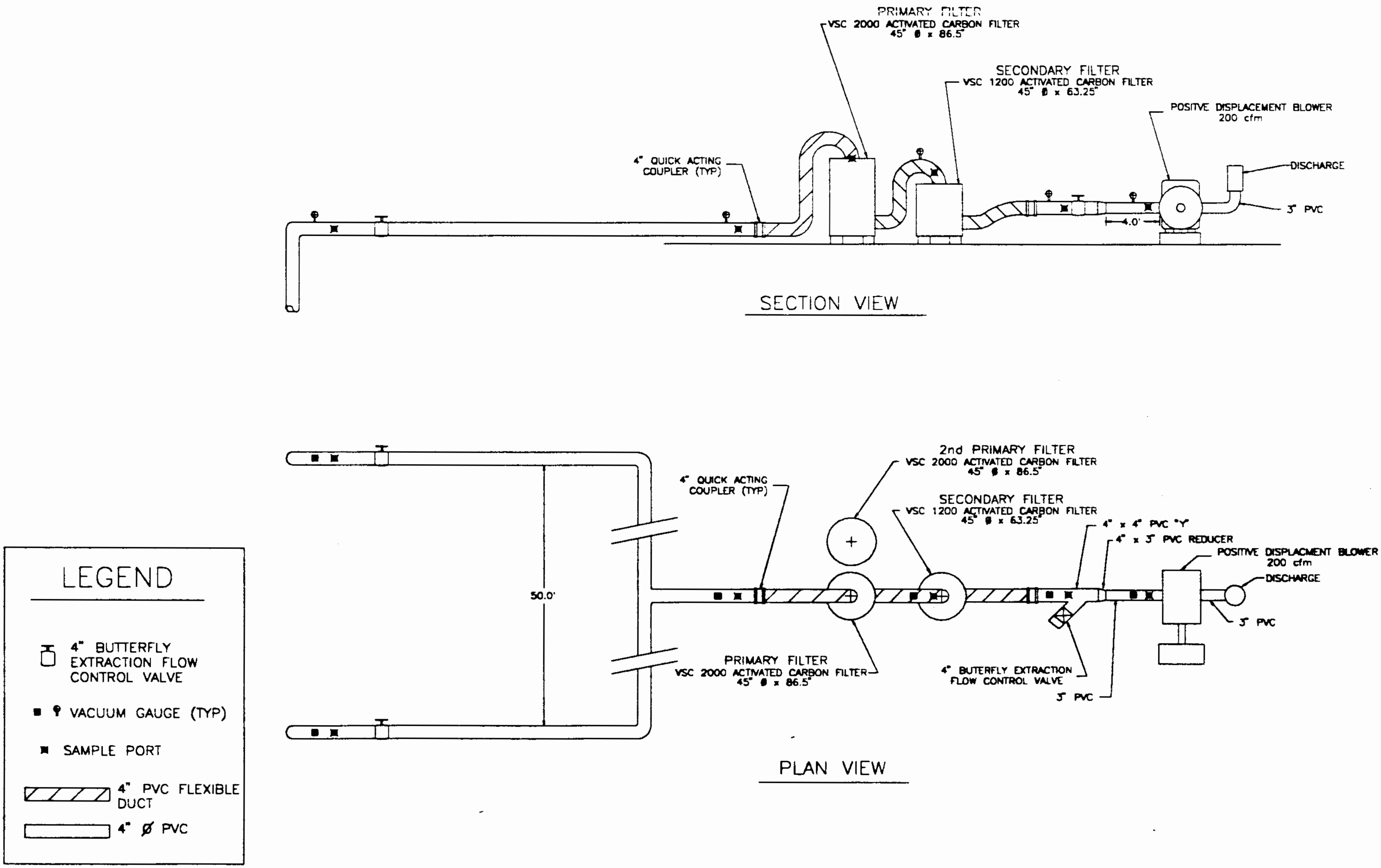
BERMITE DIVISION - WHITTAKER CORPORATION	Consulting Engineers	JUN 1989
Exisisting Groundwater Gradient Control Well, Monitoring Wells and Vapor Probe Locations	WAI Wenck Associates, Inc. Twelve Oaks Center 15500 Wayzata Blvd. Wayzata, MN 55391	Fig. 2



BERMITE DIVISION - WHITTAKER CORPORATION	WAI Consulting Engineers	JUN 1989
Proposed Vapor Extraction Vent Locations	Wenck Associates, Inc. Twelve Oaks Center 15500 Wayzata Blvd. Wayzata, MN 55391	Fig. 3



BERMITE DIVISION - WHITTAKER CORPORATION	Wenck Associates, Inc.	Consulting Engineers	JUN 1989
Vapor Extraction Vent Constructon Detail		Twelve Oaks Center 15500 Wayzata Blvd. Wayzata, MN 55391	Fig. 4



BERMITE DIVISION - WHITTAKER CORPORATION	Consulting Engineers	JUN 1989
Extracted Vapor Control System Schematic	Wenck Associates, Inc. Twelve Oaks Center 15500 Wayzata Blvd. Wayzata, MN 55391	Fig. 5

APPENDIX A

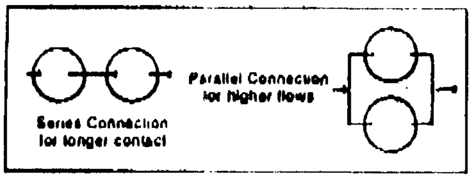
GRANULAR ACTIVATED CARBON FILTER FOR EXTRACTED VAPOR TREATMENT

Activated Carbon Systems
VENT SCRUB™

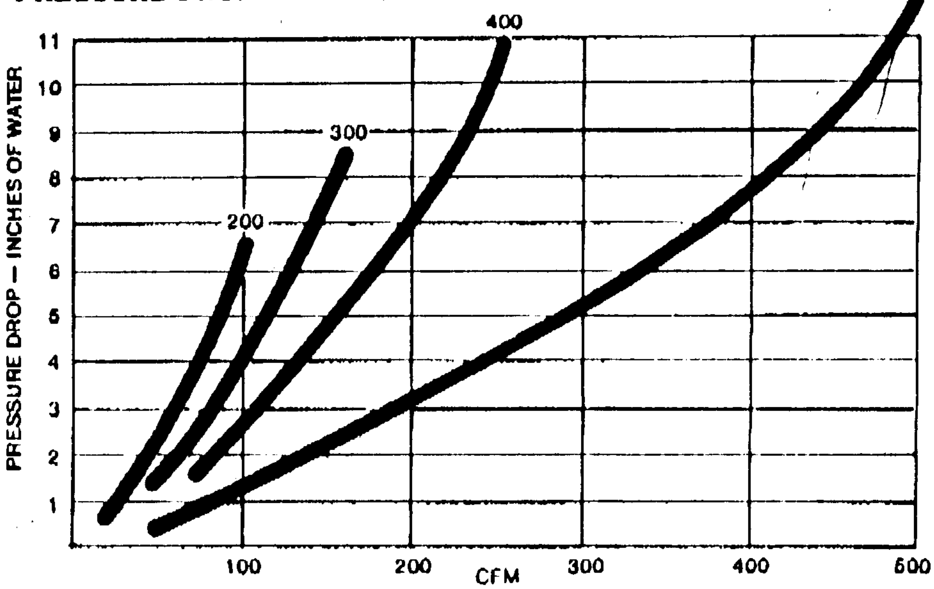
EASY TO INSTALL:

Vent-Scrub units are designed for fast and easy installation on any hard, flat surface. Place the unit as close to the vapor source as possible. The only hardware needed is properly sized pipe or ducting — rigid or flexible — for connection to the inlet/outlet ports. For outdoor use, a rain guard may be needed to protect Vent-Scrub's exhaust.

For increased contact time, connect Vent-Scrub canisters in series; for high flow rates, connect the canisters in parallel.



PRESSURE DROP



SPECIFICATIONS:

	VSC-200	VSC-300	VSC-400	VSC-1200	VSC-2000	VSC-XL
FLOW* cfm (MAX)	100	300	500	500	500	1000
PRESSURE psig (MAX)	12	5	5	9	9	9
VACUUM Inches/Hg (MAX)	18	—	—	—	—	—
TEMPERATURE °F (MAX)	200	200	200	200	200	200
DIAMETER inches	22	26	30	44	44	84
HEIGHT inches	34	39	41	66	106	106
CARBON BED DEPTH in.	25	29	31	40	80	85
CARBON FILL VOLUME cu. ft.	5.3	8.5	12.8	35.2	68.5	240
BED CROSS SECTION sq. ft.	2.6	3.7	4.9	10.6	10.6	38.5
SHIPPING WEIGHT lbs.	235	350	480	1550	**	**

* Flow rate capacity will vary with the inlet/outlet fittings, and with carbon size and type used. Two inch NPT inlet/outlet fittings are standard; other sizes available.

** Shipping weight will vary with carbon density and fittings.

WESTATES CARBON COMPANY WARRANTS THESE PRODUCTS TO COMPLY WITH THE ABOVE SPECIFICATIONS. NO OTHER WARRANTIES ARE EXPRESSED OR IMPLIED.

SAFETY:

Under certain conditions, some chemical compounds may oxidize, decompose, or polymerize in the presence of activated carbon. This could result in temperature increases sufficient to cause ignition. As a result, particular care must be taken with compounds having peroxide-forming tendencies, such as Methyl Ethyl Ketone.

SYSTEM CAPABILITIES:

For applications which cannot be handled with one of our standard units, Westates has the technical capabilities and facilities to design, engineer, fabricate, and assemble custom activated carbon adsorption systems of any size.

USEFUL LIFE:

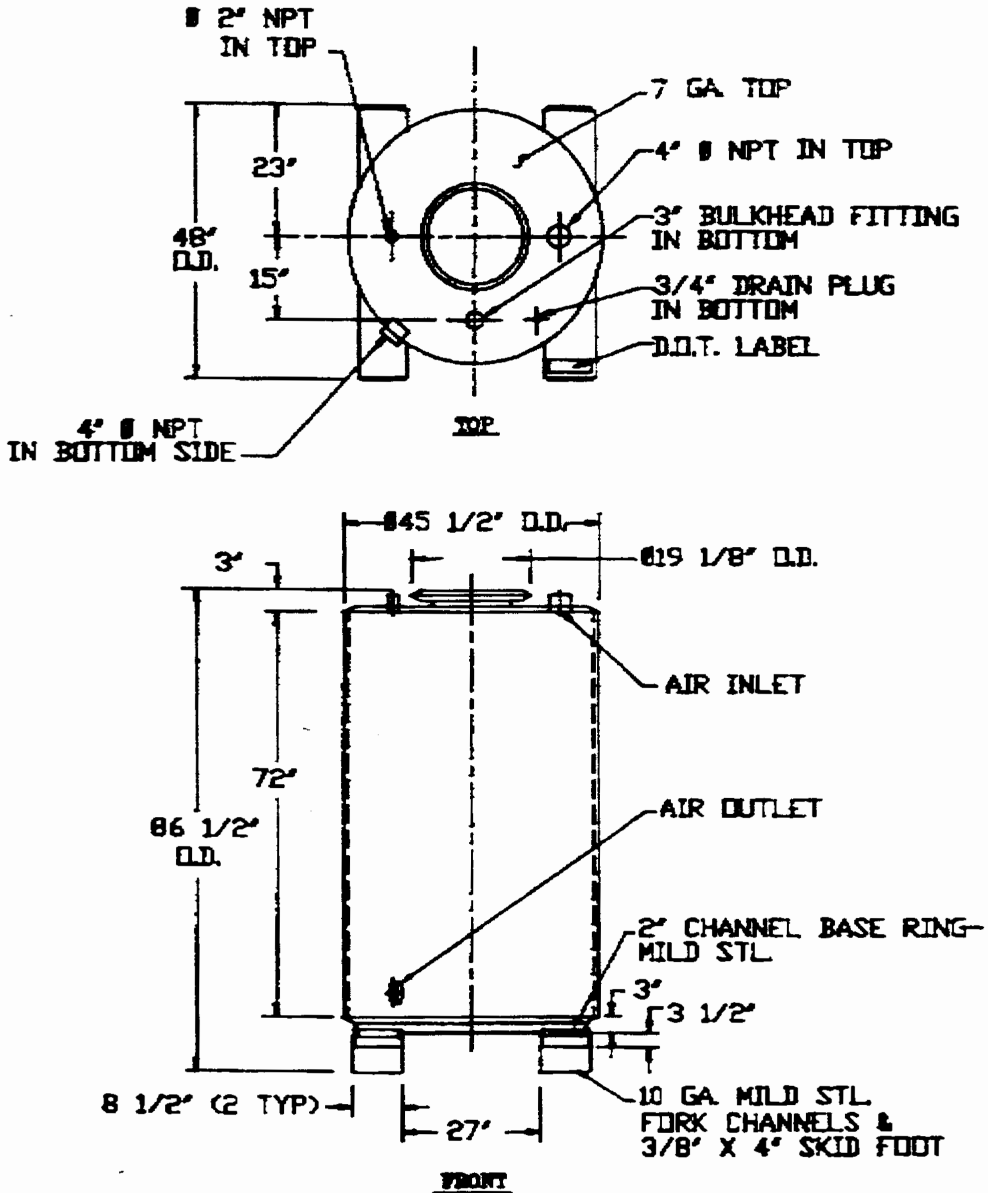
A Vent-Scrub system's capacity for adsorbing organics is a function of the composition and concentration of organic compounds in the gas stream, the gas flow rate and temperature, and the type of carbon used. Due to these variables, the system's adsorption capacity can vary significantly from case to case. Therefore, contact Westates for an estimate of useful life for your application.

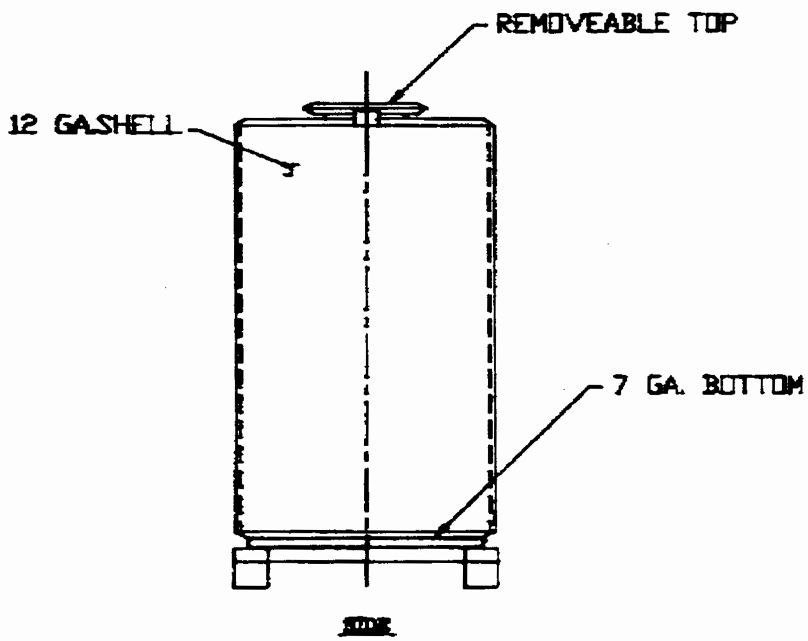
When a Vent-Scrub is saturated with contaminants, detach the unit, seal it, and dispose of it in accordance with EPA regulations. In most cases, Westates can arrange for pick-up and disposal (by thermal regeneration) of spent carbons to relieve you of the potentially costly continuing liability that is associated with other disposal approaches such a off-site burial.

CONSTRUCTION MATERIALS:

All wetted parts of the VSC-200, VSC-300, and VSC-400 are constructed of epoxy-lined carbon steel. All wetted parts of the VSC-1200, 2000, and XL are constructed of 304 stainless steel. All internal parts are constructed of either PVC, or polyethylene. Other construction materials, such as HDPE and FRP, are available at extra cost.

WESTATES CARBON CO.



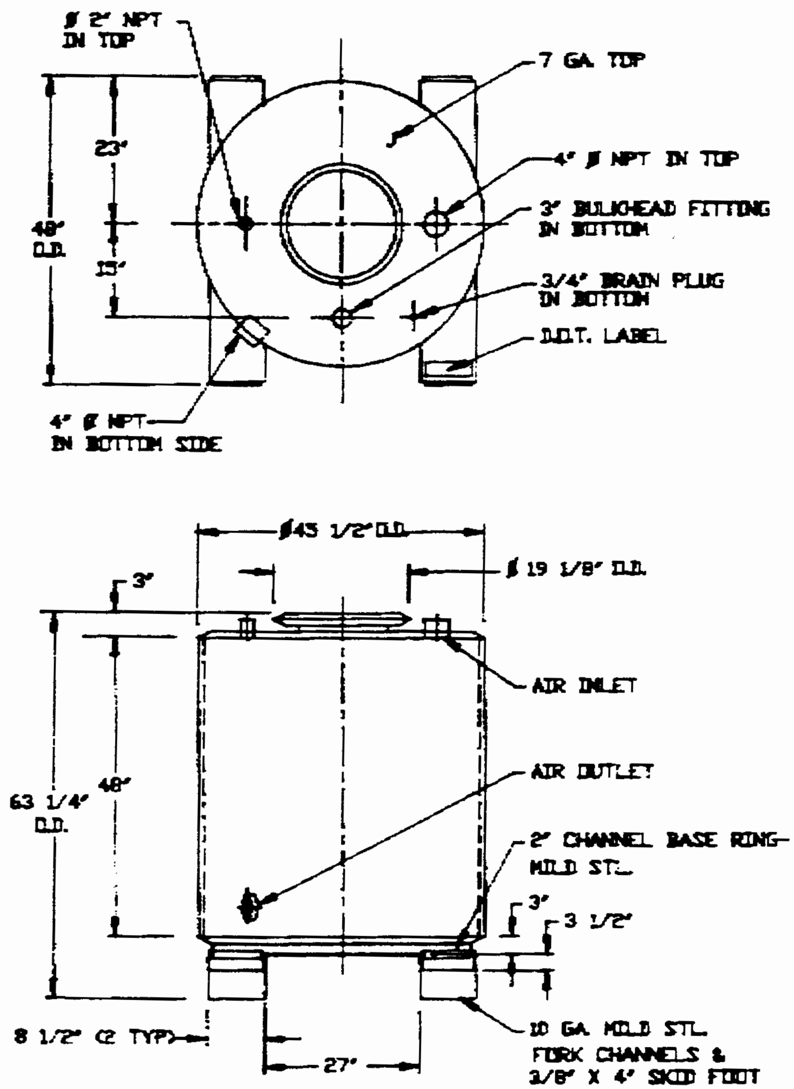


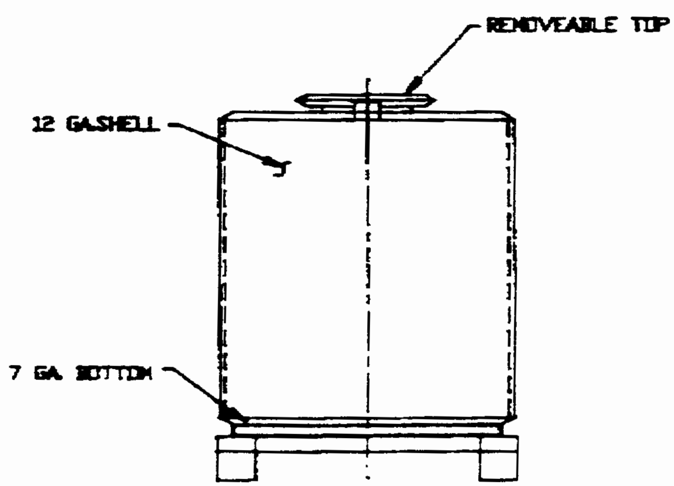
NOTES:

1. ALL WETTED PARTS CARBON ST. [illegible] [illegible] COMPLY TO D.O.T. SPEC [illegible] [illegible] REGULATIONS FOR THE TRANSPORTATION OF HAZARDOUS MATERIALS
2. [illegible] PVC
3. FULLY COATED EPOXY BAKED
4. 304 S.S. OPTIONAL
5. MAXIMUM PRESSURE 12 PSI

DATE	NUMBER	REVISIONS	BY			PROJECT NAME / PROJECT NO.
9-30-88	MV025	1-25-89	SZ			
SCALE: NTS		3-3-89	SZ			

WESTATES CARBON
LOS ANGELES, CA 90040
VENT SCRUB 2000 – 4" IN & OUT

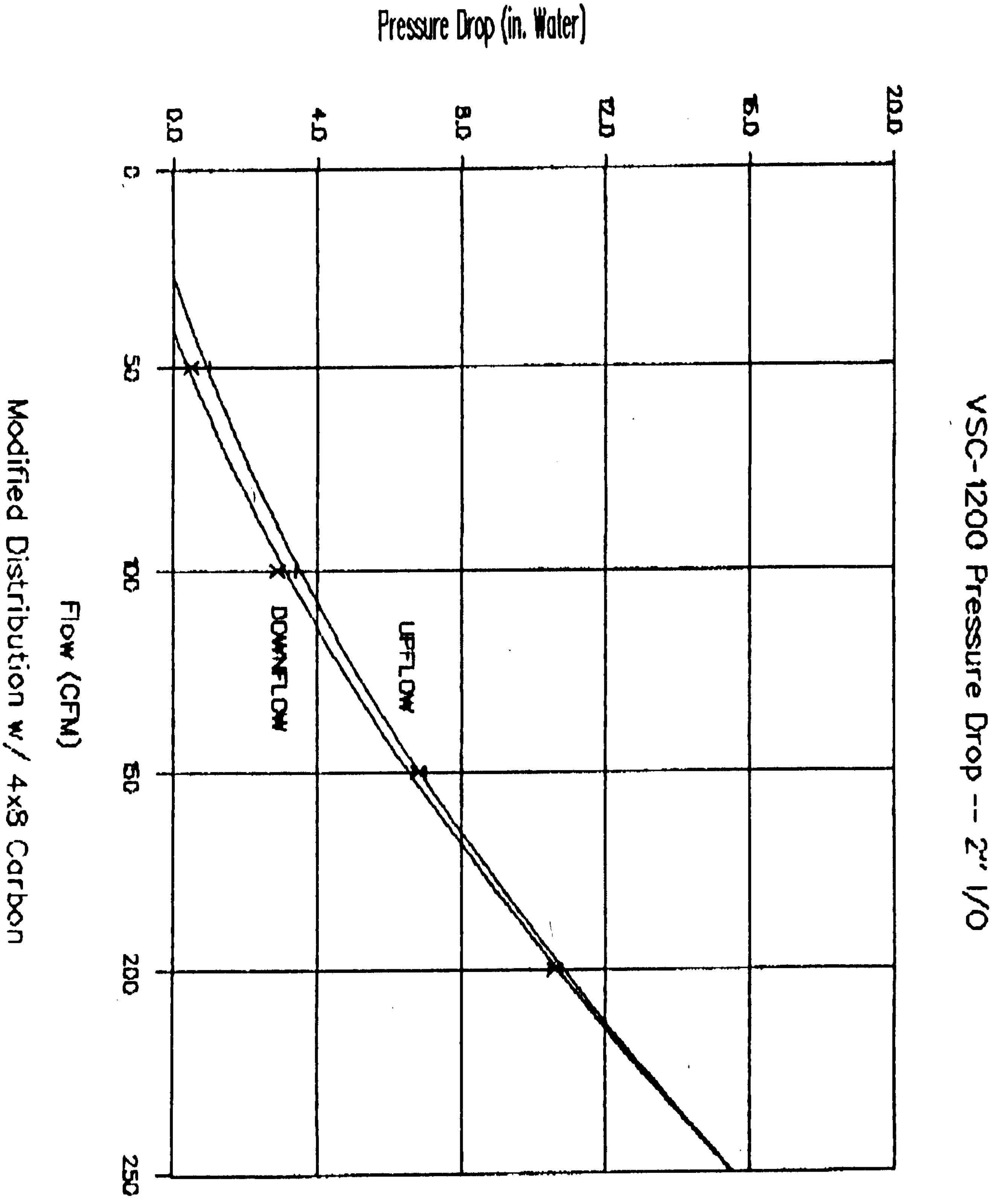




NOTES:

1. ALL WETTED PARTS CARBON ST. A570C MEETS COMPLY TO D.O.T. SPEC [illegible] FEDERAL REGULATIONS FOR THE TRANSPORTATION OF HAZARDOUS MATERIALS.
2. INTERNALS PVC
3. FULLY COATED EPOXY BAKED
4. 304 S.S. OPTIONAL
6. MAXIMUM PRESSURE 12 PSI

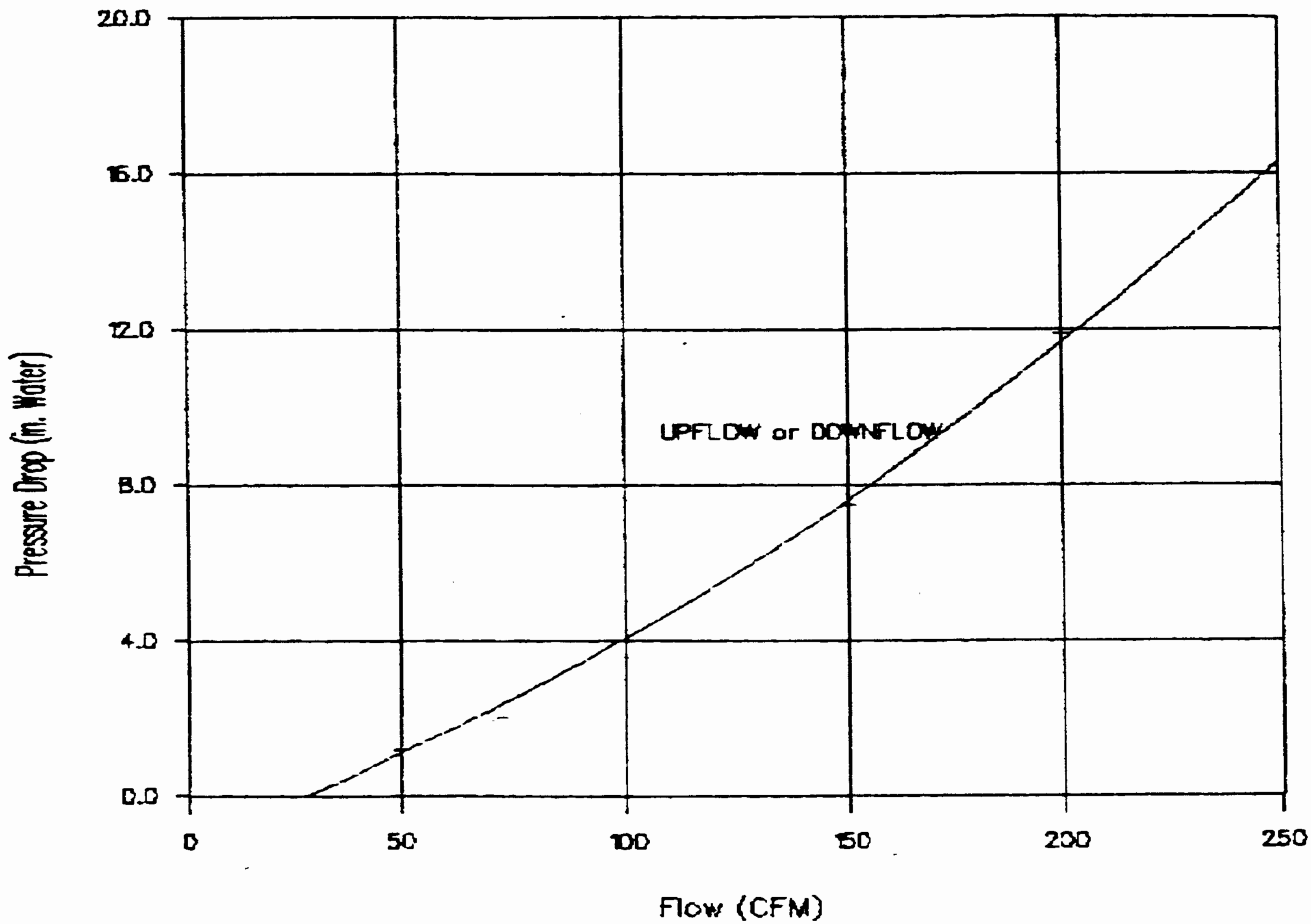
DRAWN BY: SCZ	WESTATES CARBON 2130 S. LEO AVE. LOS ANGELES CA. 90040
REVISION: 1-20-89	TITLE: VENT SCRUB 1200 4" INLET & OUTLET
SCALE: NTS	DATE: 9-30-88 DRAWING: MV002


VSC-1200 Pressure Drop -- 2" I/O
Pressure Drop (in. Water)
0.0
4.0
8.0
12.0
16.0
20.0
UPFLOW
DOWNFLOW
0
50
100
150
200
250
Flow (CFM)
Modified Distribution w/ 4x8 Carbon

1/25/89

5/8

VSC-2000 Pressure Drop -- 2" I/O



Modified Distribution w/ 4x8 Carbon